REMARKS

I. Claims

The claims have been amended as indicated herein. In order to explain the unique features to which such claims are directed, the Applicants believe it would be helpful to elaborate in greater detail, the concept behind the present invention.

Essentially, it is well known that a time varying magnetic field can create a voltage in a coil. This effect is known as the Faraday effect, and is well known to one reasonably skilled in the art. Specifically,

$$V = n * A * \frac{\partial B}{\partial t}$$

The general, linear relationship between the magnetic flux density (B) and the magnetic flux intensity (H) is B = μH, where μ is the permeability of the material. The Faraday effect device is generally known as a transformer. One should note the time varying portion of the equation. In an ideal transformer, the frequency of the input and output is the same. Also, the frequency of B and H are the same. In electrical power, for example, 60 Hz is the input and output frequency.

Further, it is also known that:

$$\vec{B} = \mu * \vec{H} + \vec{M}$$

Whereas the magnetization vector (M) is a property of the material. In some materials and configurations, such as Permalloy thin films, the magnetization vector may exist in only one of two different possible states. The transition from one state to the other (such as shown in the transition in Applicants' Figures 1 & 2) occurs

very quickly (a few nanoseconds), and thus the frequency is very high (several hundred MHz). The time component of M is not dependent on the frequency of the input signal. Thus, M(t) is not related to H(t). For example, if you put 60 Hz of H to the device, M will be 100's of MHz. With H at 1 MHz, M will still be 100's of MHz. And, since the voltage is proportional to the time derivative of B, the voltage will be small from a 60 Hz H field, and large (but for a very short period of time) from the M portion. Prior art references, such as those cited by the Examiner in previous office actins, utilize slow changes in H whereas this invention is utilizing a material that can produce a sudden flip in M (large dM/dt) to create a large dB/dt.

Thus, as indicated, for example, in Applicants' amended claim 1, a magnetic sensor is provided that includes a ferromagnetic runner having an anisotropic shape and locatable relative to a target, wherein the ferromagnetic runner comprises a permalloy material; and a coil structure wound about the ferromagnetic runner, such that when a magnetic field changes direction along an axial length of the ferromagnetic runner, a voltage is induced in the coil structure that is proportional to a time range of change of a magnetic flux thereof, thereby producing a sudden change in a magnetization vector thereof to create a large change in magnetic flux density and enable magnetic sensing operations by the magnetic sensor. Thus, such claim limitations are directed toward a device that utilizes a material that can produce a sudden flip in M (large dM/dt) to create a large dB/dt.

II. Conclusion

The Applicants have amended the claims to more particularly claim the invention. Support for the amendments is provided within the specification, and the specification adequately enables such amendments. It is believed that such amendments do not constitute new matter, but are clarifying in nature.

In view of the foregoing discussion, the Applicants respectfully request that a timely Notice of Allowance be issued.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the

undersigned representative to conduct an interview in an effort to expedite prosecution in connection with the present application. If a telephone conference would be of assistance in advancing the prosecution of this application, the Examiner is invited to call the Applicants' attorney at the below-indicated telephone number.

Respectfully submitted,

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